some (and whose existence is denied by others) which have been seen on Mercury and Venus in transit, when they have completely passed on to the disc.

S. P. LANGLEY,
Director of the Observatory
Allegheny Observatory, Allegheny, Pennsylvania,
December 6

THE transit was observed here in a cloudless sky up to sunset, but the low position and great atmospheric disturbance rendered measurements and observations of contact unreliable.

When Venus was half in on the sun, I distinctly perceived a fine curved thread of subdued light on the south-eastern edge outside the sun, and not reaching to the latter, nor extending far on any side. With three-fourths on, the thread of light reached round the remaining fourth outside, and completed the periphery. The segment of light disjoined, as when first observed, would seem to indicate a superior refractive power of the planet's atmosphere in the locality at the time.

A short time before complete ingress, the solar cusps appeared to project out from the disc in double concave forms to join the aureole. The aureole disappeared after complete ingress, but the outer portion of the planet seemed much less dark than the central, which was perfectly black within a dark brown ring of from 5″ to 10″ in breadth. I saw no trace of the black drop or ligament, and, indeed, I should imagine that the aureole crossing the position of the ligament would prevent its appearance. I found nothing like a satellite. I thought the micrometer showed a diameter of the planet rather greater from east to west than from north to south, but the *boiling* of the limbs prevented any measures that could be depended on. I remarked no distortion of the planet as recorded by observers of the previous transit.

JOHN BIRMINGHAM

Millbrook, Tuam, December 8

IN a published letter, dated "Palermo, December 13, 1882," Signor Cacciatore, Director of the Royal Observatory there, writes as follows:—"The observations of the transit of Venus, effected at our Observatory, present results, both as regards the direct observations and the spectroscopic, to which the attention of astronomers and physicists may fairly be invited. Prof. Ricco, with the spectroscope, when the planet was on the sun's disc, and her image entered upon and left the slit, observed near the spectral line B of the more refrangible side, a very weak absorption band, and also near the line C he saw traces of obscuration, but much more weak and uncertain. The same phenomenon, P. Tacchini writes me, was observed by him at Rome. Moreover, my direct observations yielded an indication of the ingress of the atmosphere of Venus upon the sun, as, from those of Prof. Millosevich in Rome, this indication was obtained on the external portion of the planet. The agreement of such observations made in different places is of no little importance for determination of the existence and the constitution of the atmosphere of Venus."

## NOTES

M. BERTRAND, perpetual secretary of the Paris Academy of Sciences, intimates that the French Government is anxious to collect any information relating to Fermat, whose statue will be unveiled very shortly at Toulouse. Those who possess any documents relating to Fermat are requested to communicate with the secretary of the Institute.

THE Johns Hopkins University Circulars contain a great amount of important scientific, as well as other information, concerning the work of that institution, which is rapidly developing into one of the most comprehensive and efficient institutions for research and education anywhere. In the number for November, for example, we have notes on the papers read by members of the University at their various societies as well as elsewhere, in mathematics, physics, philology, biology, &c., synopses of recent American scientific journals (mostly issued from the University), besides abstracts of lectures, critical notes on various subjects, and much other information. From the seventh Annual Report moreover, it is evident that the University has taken a strong hold on the American people, and that both in the spirit and the letter it is amply fulfilling the intentions of the founder. The list of the academical staff alone, professors, associates, lecturers, instructors and assistants, fills three pages, while the account of work in the various departments shows that research has become a part of the everyday life of the institution.

PROF. TYNDALL will on Thursday next (December 28), at the Royal Institution, at three o'clock, give the first of a course of six lectures (adapted to a juvenile auditory) on Light and the Eye.

THE death is announced of Dr. Theod. Lud. Wilh. von Bischoff, formerly Professor of Anatomy and Physiology at Munich University, as well as keeper of the Anatomical Institute in that city. He died on December 5 last, aged seventy-five.

ON December 1 the Agricultural Museum of Berlin was opened to the public. The curator, Herr Settegast, has arranged the zootechnical division in a commendable manner. Numerous paintings and sketches illustrate German domestic animals in their agricultural aspect. In the zoological division there are a number of interesting skeletons and skulls, amongst them a human skull from the shell-tombs at Santos (Brazil).

THE French official journal publishes a report on oyster culture, which is in favour of the Portuguese oyster. It appears that 100 grammes of the flesh of this mollusc contains about 1-10th gramme of iodine, bromine, and chlorine, just twice as much as the common oyster.

MESSRS. FOSTER AND MARTIN, of Melbourne, have sent us a graceful photograph of the comet, about which we have had so much correspondence. The photograph was taken with a 3-inch euryscope of 24 inch focus on an ordinary camera, not equatorially mounted, which doubtlessly accounts for the elongation of the nucleus. The photograph is creditable to Messrs. Foster and Martin, though it is not the first time a comet has been photographed; more than a year ago we reproduced the photograph of the comet of the period, taken by Dr. Janssen of Paris.

*Acta Mathematica* is the name of a new mathematical journal which will appear this month, simultaneously published in Stockholm, Berlin, and Paris. The editor in chief is Prof. J. Mittag-Leffler, of Stockholm, and the publication has been promised the support of the most distinguished mathematicians of Scandinavia, Germany, and France.

LAST week the Crystal Palace Company inaugurated an Exhibition of Electricity and Gas which gives even greater promise of success than that in which electricity was the sole object of attraction. Gas at present occupies the largest display. Exhibitors demonstrate the utilisation of gas, and there are many practical illustrations going on. The South Nave contains a great collection of all the best systems of improved gas lighting, Sugg's stand being distinguished by an immense standard lamp of 1000 candle power and a series of suspended lanterns of tasteful pattern of 600-candle power. There are similar great gas lights by Bray, Siemens, and others, which are submitted as competitors against the electric arc lights. In the North Nave there are numerous stands of electric apparatus and material.

THE annual meeting for the distribution of prizes and certificates in connection with the Institute for the Advancement of Technical Education was held on Thursday night in the hall of the Goldsmiths' Company, Foster Lane. After the presentation of the prizes, Dr. Siemens said that Sir Frederick Bramwell had prevailed upon him to present the prizes on this occasion, and had urged that he was a fit person to do so. The distinction made between ordinary and honour prizes, marking the addition of some scientific knowledge to proficiency in applied science, was worth the attention of all students. It was not sufficient for after-life to be efficient in a craft or calling. Unless the workman also mastered entirely the scientific principles underlying that calling, he might, in consequence of some invention changing the *modus operandi* in an occupation, be left high and dry, whereas with a knowledge of fundamental principles he could adapt himself to changed circumstances. With regard to the school in Cowper Street, he might say, having recently visited it, that the lecture rooms and the laboratory for physical science and chemistry were the most perfect he had seen, and he contrasted them with those in which he had himself received scientific instruction. He remarked upon a deficiency he had noticed in the Finsbury School—the indifferent accommodation and provision for the study of drawing, both artistic and mechanical. He hoped that art and literature would not be neglected in this scheme of education. Dr. Siemens said he hoped that through the dissemination of pure and practical science a higher spirit would take possession of the artisan, and that he would work with the object of attaining higher results and higher ends instead of discussing with his employer questions of hours and wages.

THE American papers have been devoting considerable space to Prof. Henry Draper, whose comparatively early death is regarded as a great loss to American Science. The *Tribune* has a long and interesting biographical article.

MR. A. E. GARROD has published, through Parker and Co., his able and elaborate paper, re-written, on "Nebulæ," which gained the Johnson Memorial Prize (Oxford) in 1879.

ONE of the largest avalanches ever known in Western Switzerland fell a few days ago near Ormons Dessus in Canton Vaud. It carried away several houses, piled up a mass of ice and snow 200 feet thick, and covered three square kilometres of ground. Some of the ice blocks were 18 feet long. The inmates of the houses struck were got out safely.

NEAR Tabiana (Italy) the remains of a fossil elephant have been discovered. Two enormous tusks, two teeth, and several bones from the skull were found. The objects found were submitted to scientific investigation by Prof. Strobel and Dr. Mariotti of Parma. They declared them to belong to *Elephas* (*Loxodon*) *meridionalis*, Falconer. The tusks measure 3·2 metres in length, and 0·28 metres in diameter at the thickest part. The skull bones were so much decayed that they could not be removed. It was resolved, therefore, to cover up the remains with earth until next summer, when it is hoped that warmer weather will be more favourable to further excavations.

DURING a stay near the Suez Canal last winter, Prof. Keller of Zurich made a study of the animal migrations due to the opening of this means of communication. These are very positive, though certain causes quite stop some species, or at least retard their movements, especially (1) the too sandy nature of the ground; (2) the large lakes; (3) the currents; (4) the passage of ships, which derange the ova and larvæ; (5) the too great saltness of the canal water. From the Mediterranean to Suez have passed since 1870, *Solen vulgaris*, *Umbrina cirrhosa*, *Labrax lupus*, *Balanus miser*, *Ascidia intestinalis*. Some Mediterranean species are now on their way through (*Solea vagina*, *Cardium edule*, *Sphæroma*), several fishes (*Pristipona stridens*, *Crenidens Forskali*, &c.), and some molluscs (*Cerithium scabridum*, *Mactra olorina*, *Mytilus variabilis*) have passed from the Red Sea to the Mediterranean, while quite a numerous "caravan" is now resting in the basins of the great Bitter Lakes. The fauna of the canal is still too poor for large carnivorous species to find a living in it; hence rays, cuttlefishes, &c., do not migrate. Red Sea corals also have not passed into the canal.

THE *Overland China Mail* gives an account, taken from the Manila papers, of the typhoon which visited the Philippine Islands on October 20. The typhoon began at eight o'clock in the morning, and continued with unabated fury until about two o'clock in the afternoon. Not a house in Manila escaped injury. During the storm it was utterly impossible to walk in the streets, owing to the force of the wind, which was rolling carriages along like playthings, and keeping sheets of iron roofing floating in the air like pieces of paper. It is said that during the typhoon several shocks of earthquake were felt. No such destructive typhoon has visited the islands since 1831. The record taken at the Observatory says that the greatest velocity attained by the anemometers reached 144·4 English miles per hour; nothing could resist this force of wind. The vortex was touched at 11·40 a.m., when the minimum barometer reached 727·60 millimetres. The greatest violence of the hurricane could not be indicated, because all the anemometers were rendered useless before the severest gusts came.

THE eleventh annual *soirée* and exhibition of the Lambeth Field Club and Scientific Society will take place on Monday evening, January 1, 1883, at St. Philip's Schools, Kennington Road, S.E.

PROF. GUSTAV VON HAYEK, an eminent Vienna naturalist, is editing a large Atlas of Natural History. Five parts have appeared, and the work will be complete in fifteen. Each part contains eight plates folio size. Moritz Perles, of Vienna and Leipzig, is the publisher.

"MYTHOLOGIE und Civilisation der Nordamerikanischen Indianer" is the title of a little work just completed by Herr Karl Knortz, and published by Paul Frohberg of Leipzig.

A VIOLENT shock of earthquake was felt at Siders (Canton Valais) on December 5 at 3.40 p.m.; the direction of the shock was from east to west.

THE French Lower House has adopted the project of subterranean telegraphic lines, which had elicited some criticism.

ON the 2nd inst. Dr. Finsch, who recently returned to Berlin, after an absence of over three and a half years, reported upon his travels before the Geographical Society of Berlin. He first proceeded to Micronesia in order to study the ethnology of the rapidly disappearing natives of those groups of islands. From Honolulu he proceeded to Oahu, where he visited the old burial-grounds. At Maui he succeeded in obtaining a specimen of a bird that is very nearly extinct, and from the scarlet feathers of which formerly the royal mantles were made. In March 1880 he accompanied the German Consul, Herr Hernheim, to the Caroline group, and saw the ruins of the celebrated colossal edifices there. In July Dr. Finsch proceeded to New Britain. He stayed there for eight months, and then went to visit the Maoris in New Zealand. At the beginning of 1882 he proceeded to New Guinea, in August he left for Batavia and then for Europe, having travelled over 30,000 miles. His collections comprise 4000 ethnological objects from 43 localities, 290 skulls, 200 samples of hair, 200 casts of faces taken from living individuals in 66 different places, 6000 vertebrata, 30,000 invertebrata, 1000 plants, numerous minerals, 400 photographs, and 200 sketches.

THE Russian Geographical Society has addressed to other scientific societies of Russia a proposal to collaborate in the publication of a general description of Siberia. The Geographical Society undertakes for its part the publication of a geographical description and of a general bibliographical index of all works and papers on Siberia.

THE Belgian expedition for the investigation of the Upper Congo has left Antwerp on board the steamer *Harkaway*. The party consists of Dr. van der Heuvel, Herr Schaumann, an Austrian officer, and several mechanics. The expedition takes out large stores of goods, including samples of the seeds of all nutritious vegetables grown in Belgium. They are to proceed as quickly as possible to the furthest of Stanley's stations, and then penetrate further if possible.

THE additions to the Zoological Society's Gardens during the past week include a Chacma Baboon (*Cynocephalus porcarius* ♀) from South Africa, presented by Mr. J. W. Browne; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Lady Sibyl Tollemache; a Smooth-headed Capuchin (*Cebus monachus*) from South-East Brazil, presented by Mr. A. J. McEwen; a Squirrel Monkey (*Chrysothrix sciurea* ♂) from Guiana, presented by Mr. M. Escaré; a Rhesus Monkey (*Macacus erythræus* ♂) from India, presented by Mr. G. V. Sawyer; two Leadbeater's Cockatoos (*Cacatua leadbeateri*) from Australia, presented by Mr. C. J. Harvey; a Common Barn Owl (*Strix flammea*), British, presented by the Rev. A. Reece; a Ring-hals Snake (*Sepedon hæmachetes*), a Rhomb-marked Snake (*Psammophylax rhombeatus*) from South Africa, presented by Mr. H. Pillans; a Lesser White-nosed Monkey (*Cercopithecus petaurista* ♂) from West Africa, deposited; a Long-eared Owl (*Asio otus*), British, a Marbled Cat (*Felis marmorata*) from Assam, purchased; a Red Kangaroo (*Macropus rufus* ♂) born in the Gardens.

## OUR ASTRONOMICAL COLUMN

MEASURES OF DOUBLE STARS.—We receive at about the same time several important series of measures of double stars.

(1) "Results of double star measures made at the Sydney Observatory, N.S.W., 1871 to 1881," under the direction of Mr. H. C. Russell, Government Astronomer for New South Wales. From 1871 to 1874 the instrument employed was a very fine 7¼-inch refractor by Merz; after 1874 the 11½-inch refractor by Schröder was substituted, the same method of observation being followed with both instruments. For the more difficult objects, a power of 330 was applied on the Merz telescope, and one of 800 on the larger refractor. The objects measured include about 746 of Herschel's stars, and it is unnecessary to say more than this, to show the importance and value attaching to the catalogue, no measures of a large number of the stars having been put upon record since the publication of Sir John Herschel's Cape Volume. In addition to these objects, however, Mr. Russell's catalogue includes measures of 350 new double stars detected at Sydney, and he remarks that it would have been easy to double the number if he had adopted the same limit of distance as Sir John Herschel, and without making any very strict examination of the southern heavens, which will be a hint to future workers in this branch of astronomy in the other hemisphere. Some of Herschel's stars, Mr. Russell says, present considerable difficulty, but are probably in motion; thus $\gamma$ Lupi, an easy double star in 1836, is now single under the highest power on his large equatorial; $\pi$ Lupi, which Herschel found "excessively difficult," is now quite an easy object with the Sydney refractor; $h$ 4854 is another star of the same character; in June, 1872, it was easily divided with power 230; in June, 1874, it could not be divided with any power; and in July, 1880, it presented only a round disc with all powers on the large telescope.

Mr. Russell has made an innovation in the manner of expressing the dates of the separate sets of measures, which appears an unfortunate one: instead of giving them according to the usual method, as fractions of the different years, he has three columns with "Day of the month," "Month of the year," and "Year in the 19th century," and this inconvenient expression of dates is not remedied without some trouble, by means of the table at p. 68, showing day and fraction of year. The computer of double-star orbits in taking means of sets of measures for an epoch to work upon, will hardly appreciate this innovation.

(2) "Micrometric measurements of double-stars" in vol. xiii. part 1, of "Annals of the Astronomical Observatory of Harvard College." This is a valuable catalogue of measures of about 350 stars in upwards of one thousand sets, made with the 15-inch refractor at Harvard College, chiefly in the years 1866-1872, under the direction of Prof. Winlock, but including a few obtained by the Bonds, and by Mr. Waldo, which have previously appeared in the *Proceedings* of the American Academy of Arts and Sciences, and in the *Astronomische Nachrichten*. The catalogue includes nearly all the more interesting binaries and many difficult objects. In addition, Prof. Pickering publishes a list of 179 double stars discovered at Harvard College Observatory, some of which have been independently detected by Mr. S. W. Burnham; these were found to a considerable extent during an exploration of the southern heavens, occasionally instituted in the intervals of other observations. In the cases of some of the principal revolving doubles as $\gamma$ Virginis, 70 Ophiuchi, &c., the measures extend to the year 1876.

(3) "Measures of the principal double stars in rapid orbital motion," made in the years 1875-1882, with the Merz refractor of the Observatory of Brera, Milan by Prof. Schiaparelli; an important series of results which will be most welcome to those who are engaged in the investigation of double star orbits, since in most cases, there are measures later than any others available at the present moment. We extract a few of the more recent mean results:—

| | | Position | Distance |
|---|---|---|---|
| | | ° | ″ |
| $\zeta$ Cancri (A : B) ... | 1882·247 ... | 75·07 ... | 0·980 |
| $\omega$ Leonis ... ... | 1882·363 ... | 89·99 ... | 0·55 |
| $\xi$ Ursæ Majoris ... | 1882·386 ... | 261·06 ... | 1·928 |
| $\eta$ Coronæ Borealis ... | 1882·503 ... | 135·37 ... | 0.594 |
| $\mu^2$ Bootis ... ... | 1882·521 ... | 120·40 ... | 0·795 |
| $\zeta$ Herculis ... ... | 1882·602 ... | 101·55 ... | 1·473 |
| $\tau$ Ophiuchi ... ... | 1882·600 ... | 252·13 ... | 1·860 |
| 70 Ophiuchi ... ... | 1882·609 ... | 51·83 ... | 2·336 |

No trace of the companion of $\gamma$ Coronæ Borealis was visible in the years 1875-1881. In 1882 a prominence was once suspected at 120°, but at other times the star was single. In 1875-1879, however, this star was single in the Washington 26-inch refractor.

## PHYSICAL NOTES

PROF. W. KOHLRAUSCH gives the following as the results of recent experiments on the electric conductivity of the haloid salts of silver. Chloride, bromide, and iodide of silver at temperatures above their melting-points conduct far better than the best conducting liquids (sulphuric acid, &c.) at ordinary temperatures do. Chloride of silver conducts best, iodide worst of the three. The chloride and the iodide of silver change their resistance very greatly and suddenly on solidifying, the resistance increasing more than a million-fold by cooling through 20°. More remarkable still, iodide of silver undergoes absolutely no change of conductivity at its melting-point (540°), but shows a rapid decrease at the temperature (145°) at which it passes from the amorphous to the crystalline state.

NEW combinations to serve for direct-vision prisms have been suggested recently by several persons. Mr. C. D. Ahrens uses a bisulphide prism cemented between two flint glass prisms, giving a wide dispersion with little loss of light. Herr Fuchs employs a single isosceles glass prism in the position of minimum deviation, a silver-faced mirror being attached to the basal face of the prism to rectify the ray after emergence. Signor A. Ricco has described a similar combination, a total-reflexion prism being substituted for the mirror. He has also constructed the second prism of the combination of a four-sided form, so that it not only rectifies the ray which has been deflected by the first prism, but also augments the dispersion of the first prism by a nearly equal amount.

THE electric resistance of mercury is, according to R. Lenz, affected by pressure. Between the limits of 2 and 60 atmospheres' pressure, the resistance of a quicksilver column 1·2 metres long, inclosed in thermometer tubing, diminished ·02 per cent. for each additional atmosphere.